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ENDOCARDIAL VENTRICULAR REPOLARIZATION OSCILLATES AT RESPIRATORY FREQUENCIES IN HUMANS: INSIGHTS ON ENTRAINMENT FROM WAVELET ANALYSIS

ACC Poster Contributions
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Background: Breathing is known to affect cycle length (RSA) and other aspects of heart function by mechanical and neural interactions. The influence of respiration on repolarization properties remains unclear, but may be of arrhythmogenic importance.

Methods: We studied 13 human patients with normal ventricles. Decapolar catheters were placed on LV posterior and RV anterior septal wall to record activation-recovery intervals (ARI) as a surrogate for APD while pacing at a constant cycle length of 500ms from RV apex. The patients controlled their breathing to follow an on-screen model, which invoked several different respiratory frequencies (6 br/min - 30 br/min). Chest circumference was measured to verify the respiratory pattern. The Wavelet Transform was used to expose the frequency spectrum of ARI as well as rapid changes in the spectrum.

Results: In all patients, sites were found at which ARI oscillated at the respiratory frequency, with $p<0.0001$ for the no-correlation hypothesis. During changes in respiratory frequency, these oscillations adapted rapidly to match the new frequency. The effect was heterogeneous; the range of the oscillations typically varied from 0-25 ms.

Conclusions: Ventricular endocardial repolarization oscillates at respiratory frequencies independent of cycle-length, generating spatially heterogeneous repolarization. Wavelet Transform analysis exposed rapid entrainment to changes in frequency. These results may have important implications for arrhythmogenesis.